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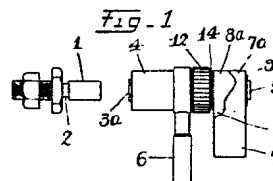
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54 **Earth terminal for electrical equipments.**

57 An earth terminal for electrical equipments which is adapted to be attached to and detached from a ground pin. It comprises a collet 3 having locking hooks 3a capable of clamping a ground pin 1 and engageable with a neck portion 2 thereof, a main tubular body 4 in which the collet 3 is inserted in such a manner that the locking hooks 3a project from a mouth 4a thereof, a connector 6 for an earthing conductor, which is formed integrally with the collet 3 and projecting partially from a rear end of the tubular body 4, a pair of operating levers 7, 8 through which a rear end portion of the shaft 5 is inserted, a holding member consisting of a stop ring 9 mounted fixedly on a rear tip portion of the shaft 5 so as to receive one of the operating levers 7, 8, a coil spring 10 provided around a front end portion of the shaft 5 so as to urge the collet 3 in the forward direction, a pair of annular face cams 7a, 8a, which are engaged with each other, and which are formed integrally with the operating levers 7, 8, respectively, so as to surround the shaft 5, and projections 3b having inclined surfaces, formed on the outer surfaces of the locking hooks 3a of the collet 3, and adapted to come into engagement with the mouth 4a of the tubular body 4.



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## EARTH TERMINAL FOR ELECTRICAL EQUIPMENTS

This invention relates to an earth terminal for electrical equipments.

5 The operation of a conventional earth terminal for electrical equipments is complicated. It is not fit to a ground pin reliably: there is a possibility that the terminal will come off from the pin unexpectedly. In addition, the contact resistance between the earth terminal and the ground pin is unstable. In the pro-  
10 duction of such an earth terminal, it is necessary that the material be subjected to a milling process, a process for making a positioning bore therein, and a tapping process, and so on. Accordingly, it is difficult and expensive to manufacture such an earth  
15 terminal.

An object of the present invention is to provide an earth terminal which is free from the above-mentioned drawbacks encountered in the conventional earth terminal, and which can be operated easily with  
20 a small force, fitted reliably around a ground pin without a possibility that the earth terminal is disengaged from it unexpectedly, maintains stable the contact resistance with the ground pin, minimizes the number of parts and manufacturing steps, and reduces  
25 the manufacturing cost.

In order to achieve the above object, the present invention is formed as follows.

The present invention provides an earth terminal for electrical equipments, comprising a collet having locking hooks capable of clamping a ground pin and engageable with a neck portion thereof, a main tubular body in which the collet is inserted in such a manner that the locking hooks project from its mouth, a connector for an earthing conductor, which is formed integrally with the tubular body, a shaft formed integrally with the collet and projecting partially from the rear end of the tubular body, a pair of operating levers through which a rear end portion of the shaft is inserted, a holding member consisting of a stop ring mounted fixedly on a rear tip portion of the shaft so as to receive one of the operating levers, a coil spring provided around a front end portion of the shaft so as to urge the collet in the forward direction, a pair of annular face cams engaged with each other and formed integrally with the respective operating levers so as to surround the shaft, and projections having inclined surfaces, formed on the outer surfaces of the locking hooks of the collet, and adapted to come into engagement with the mouth of the tubular body.

When the locking hooks of the collet, which project from the mouth of the main tubular body, are pressed against a ground pin against the resilient force of the coil spring, the projections having inclined surfaces disengage from the mouth of the tubular body. Consequently the collet, which is urged in the opening direction, opens as it is moved backward, and allows the free end portion of the ground pin to enter the space between the locking hooks of the collet. When the ground pin has been inserted deep into this space, the collet is moved forward by the resilient force of the coil spring bringing the projections having inclined surfaces into engagement with the mouth of the tubular body and contracting the collet. At the same time, the locking hooks engage with the neck portion of the ground pin. Thus, the earth terminal according to the present invention is engaged with the ground pin. When the two operating levers are pressed inward by the finger tips with the earth terminal and ground pin in this engaged state, the two annular face cams formed with the operating levers are disengaged from each other, drawing the shaft backward via the stop ring against the resilient force of the coil spring and opening the collet. Accordingly, the earth terminal can be freely removed from the

ground pin. Thus, the earth terminal according to the present invention can be operated very naturally. It can also be operated easily and reliably even in an emergency or even by a person who is inexperienced in handling earth terminals. Moreover, the two operating levers can be moved with a small force to disengage the collet from the ground pin owing to the annular face cams formed integrally therewith. The present invention also permits a collets slotting process employed in the production of conventional earth terminals to be omitted. Since the connector for an earthing conductor, of the earth terminal according to the present invention is formed integrally with the tubular body, a process for making a mounting bore can be omitted. Therefore, this earth terminal can be manufactured by a turning process only. In addition, the present invention minimizes the number of parts of the earth terminal, simplifying assembly, and reducing the manufacturing cost.

Since the operating levers for the earth terminal according to the present invention are formed pivotably, the earth terminal is not operated unexpectedly even when it receives an external force. This earth terminal can be set on a ground pin simply by pressing it against the pin.

A flange for receiving one end of the coil spring is provided on the outer surface of a boundary region between the collet and shaft, and a nut for receiving the other end of the coil spring is screwed to male threads formed on the tubular body. The spring-receiving flange is preferably formed wide enough to allow the flange to enclose the free end portion of the ground pin when the collet is fitted around the ground pin. This permits the neck and free end portion of the ground pin engaged with the collet to be fixed in a stable condition by the locking hooks of the collet and the spring-receiving flange. Therefore, even when the ground pin and collet are twisted about the same axis, the pin is not displaced and the collet is not damaged. Moreover, the contact resistance between the ground pin and earth terminal can be kept stable.

If a hollow is formed in the central portion of the connector for an earthing conductor, with a recess provided in its outer surface, the connector is broken at the recess if an external force is applied to it by accident, for example, if someone's foot catches the earthing conductor. This can prevent the equipment from being dropped or falling. When the connector is broken, the earthing conductor can be con-

ected temporarily by press-fitting a metal rod,  
such as a nail into the hollow therein.

The accompanying drawings illustrate an embodiment of an earth terminal for electrical equipments according to the present invention, wherein:

Fig. 1 is a side elevational view;

Fig. 2 is a front elevational view;

Fig. 3 is a side elevational view in longitudinal section;

Fig. 4 is a side elevational view in longitudinal section, in which a collet is opened;

Fig. 5 is a cross-sectional view, in which the collet is fit around a ground pin; and

Fig. 6 is a sectional view of another example of a connector for an earthing conductor.

The earth terminal for electrical equipments, which is illustrated in the drawings, comprises a collet 3 having locking hooks 3a capable of clamping a ground pin 1 and engageable with a neck 2 thereof, a main tubular body 4 in which the collet 3 is inserted in such a manner that the locking hooks 3a project from a mouth 4a thereof, a connector 6 for an earthing conductor, which is formed integrally with the tubular body 4, a shaft 5 formed integrally with the collet 3 and projecting partially from the rear end of the

tubular body 4, a pair of operating levers 7, 8 through which a rear end portion of the shaft 5 is inserted, a holding member consisting of a stop ring 9 mounted fixedly on the rear tip of the shaft 5 so as to receive one of the operating levers 7, 8, a coil spring 10 provided around the front end portion of the shaft 5 so as to urge the collet 3 in the forward direction, a pair of annular face cams 7a, 8a, which are engaged with each other, and which are formed integrally with the operating levers 7, 8, respectively, so as to surround the shaft 5, and projections 3b having inclined surfaces, formed on the outer surfaces of the locking hooks 3a of the collet 3, and adapted to come into engagement with the mouth 4a of the tubular body 4.

The present invention has the above-described construction. When the locking hooks 3a of the collet 3, which project from the mouth 4a of the main tubular body 4, are pressed against a ground pin 1 against the resilient force of the coil spring 10, the projections 3b having inclined surfaces are disengaged from the mouth 4a of the tubular body 4. Consequently, the collet 3, which is urged in the opening direction, opens as it is moved backward to allow the free end portion of the ground pin 1



to enter the space between the locking hooks 3a of the collet 3. When the ground pin 1 has been inserted deep into the above-mentioned space, the collet 3 is moved forward by the resilient force of the coil spring 10. As a result, the projections 3b having inclined surfaces come into engagement with the mouth of the tubular body 4, so that the collet 3 is contracted. At the same time, the locking hooks 3a come into engagement with a neck portion 2 of the ground pin 1. Thus, the earth terminal according to the present invention is engaged with the ground pin 1. When the two operating levers 7, 8 are pressed in by the finger tips with the earth terminal and ground pin 1 in such engaged state, the two annular face cams 7a, 8a formed with the operating levers 7, 8 are disengaged from each other. This draws the shaft 5 backward via the stop ring 9 against the resilient force of the coil spring 10, so that the collet 3 is opened. Accordingly, the earth terminal can be removed from the ground pin 1 freely. Thus, the earth terminal according to the present invention can be operated very naturally. It can also be operated easily and reliably even in an emergency or even by a person who is inexperienced in handling earth terminals. Moreover, both of the operating levers 7, 8 can be

5 moved with a small force owing to the annular face  
cams 7a, 8a formed integrally therewith to disengage  
the collet 3 from the ground pin 1. The present  
invention also permits a collet-slotting process  
employed in the production of conventional earth  
terminals to be omitted. Since the connector 6 for  
an earthing conductor, in the earth terminal accord-  
ing to the present invention is formed integrally  
with the tubular body, a process for making a mount-  
10 ing bore can be omitted. Therefore, this earth  
terminal can be manufactured by a turning process  
only. In addition, the present invention permits  
the number of parts of the earth terminal to be mini-  
mized, simplifying the assembly and reducing the  
15 manufacturing cost.

Since the operating levers for the earth terminal  
according to the present invention are formed pivotably,  
the earth terminal is not operated unexpectedly even  
when it receives an external force. This earth ter-  
20 minal can be set on a ground pin simply by pressing it  
against the pin.

In the embodiment shown in the drawings, a flange  
11 for receiving one end of the coil spring 10 is pro-  
vided on the outer surface of a boundary region be-  
25 tween the collet 3 and shaft 5, and a nut 12 for

receiving the other end of the coil spring is  
screwed to a male thread 13 formed on the tubular  
body 4. The spring-receiving flange 11 is formed  
wide enough to allow the flange 11 to enclose the  
5 free end portion of the ground pin 1 when the collet  
3 is fitted around the ground pin 1. This permits  
the neck 2 and free end portion of the ground pin 1  
engaged with the collet 3 to be fixed in a stable  
condition by the locking hooks 3a of the collet 3  
10 and the spring-receiving flange 11. Therefore, even  
when the ground pin 1 and collet 3 are twisted about  
the same axis, the pin is not displaced and the  
collet is not damaged. Moreover, the contact resist-  
ance between the ground pin 1 and earth terminal can  
15 be kept stable. Referring to the drawings, reference  
numeral 14 denotes a wave shaped washer provided  
between the main tubular body 4 and operating lever  
8. In the example of the connector 6 for an earth  
conductor shown in Fig. 6, a hollow 6a is formed in  
20 its center, and a recess 6b is provided in its outer  
surface, so the connector 6 will break at the recess  
6b if an external force is accidentally applied,  
for example, when someone's foot  
catches the earth conductor. This can prevent the equip  
25 -ment from being dropped or falling. When the

connector 6 is broken, the earth conductor can be connected temporarily by press-fitting a metal rod, such as a nail into the hollow 6a.

5 The earth terminal according to the present invention is used mainly for medical electrical equipments. It can also be utilized for general household electric appliances.

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## Claims:

1. An earth terminal for electrical equipments which is adapted to be attached to and detached from a ground pin, characterized in that said earth terminal includes: a collet 3 having locking hooks 3a capable of clamping a ground pin 1 and engageable with a neck portion 2 thereof; a main tubular body 4 into which said collet 3 is inserted in such a manner that said locking hooks 3a project from a mouth 4a thereof; a connector 6 for an earthing conductor, which is formed integrally with said tubular body 4; a shaft 5 formed integrally with said collet 3 and partially projecting from the rear end of said tubular body 4; a pair of operating levers 7, 8 through which a rear end portion of said shaft 5 is inserted; a holding member consisting of a stop ring 9 mounted fixedly on a rear tip portion of said shaft 5 so as to receive one of said operating levers 7, 8; a coil spring 10 provided around a front end portion of said shaft 5 so as to urge said collet 3 in the forward direction; a pair of annular face cams 7a, 8a, which are engaged with each other, and which are formed integrally with said operating levers 7, 8, respectively, so as to surround said shaft 5; and projections 3b having inclined surfaces,

formed on the outer surfaces of said locking hooks  
3a of said collet 3, and adapted to come into  
engagement with said mouth 4a of said tubular body 4.

2. An earth terminal for electrical equipments as  
5 claimed in Claim 1, wherein said earth terminal fur-  
ther includes a spring-receiving flange 11 provided  
on the outer surface of a boundary region between  
said collet and said shaft 5, and having a width  
large enough to allow said flange 11 to enclose the  
10 free end portion of said ground pin 1 when said col-  
let 3 is fitted around said ground pin 1.

3. An earth terminal for electrical equipments as  
claimed in Claim 1, wherein said connector 6 for  
an earthing conductor is provided with a hollow 6a  
15 in the central portion thereof, and a recess 6b in  
the outer surface thereof.

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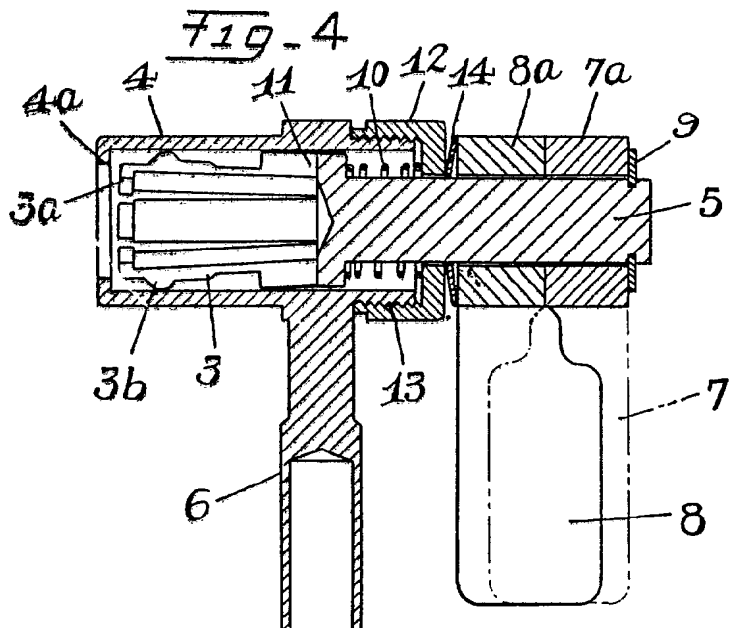
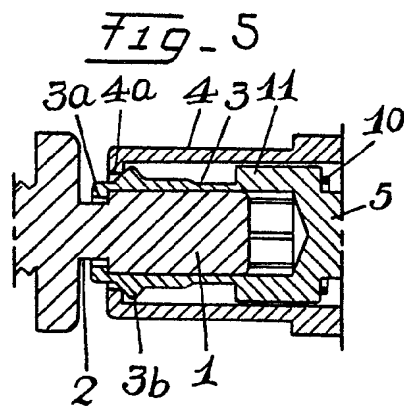
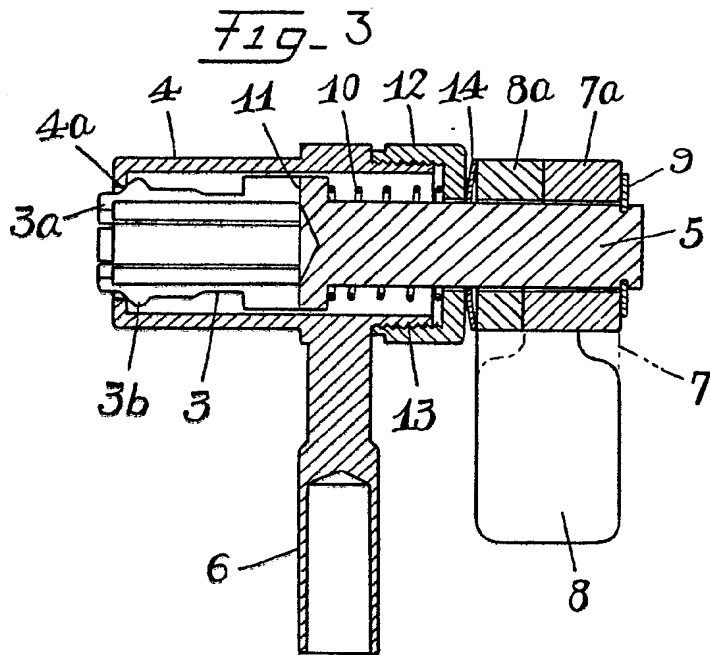
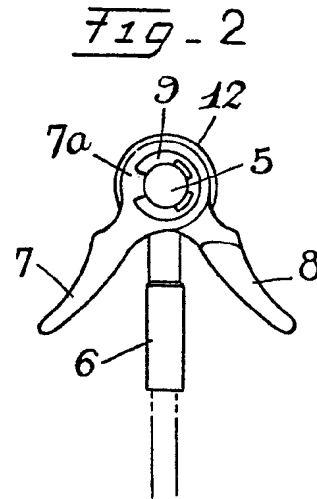
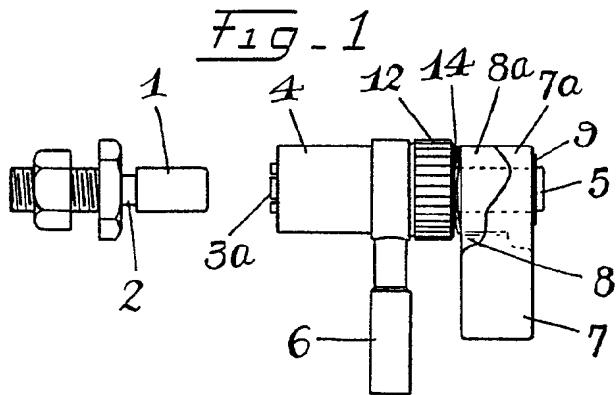
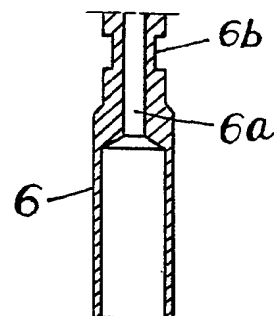


Fig. 6





European Patent  
Office

# EUROPEAN SEARCH REPORT

0066441

Application number

EP 82 30 2663

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
A	US-A-4 054 762 (MIDLAND-ROSS) * figure 6; column 3, line 63 to column 4, line 25 *	1	H 01 R 13/20 H 01 R 13/652
A	--- US-A-3 493 917 (VIKING IND.) * figures 1-3; column 2, line 37 to column 3, line 27 *	1	
A	--- FR-E- 20 447 (LA VALETTE) * figure 1; page 2, lines 7 to 37 *	1	
A	--- US-A-2 567 727 (AMERICAN PHENOLIC) * figures 1-4; column 3, line 1 to column 4, line 21 *	1,2	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			H 01 R 13/00 H 01 R 15/00
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>13-09-1982</b>	Examiner <b>WAERN G.M.</b>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p>			